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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/764,092 | 01/23/2004 | James Mitchell Tour | 122302.00012 (UNTD-0029) | 8256 |
| 25555 | 7590 | 12/05/2007 | EXAMINER | |
| JACKSON WALKER LLP 901 MAIN STREET SUITE 6000 DALLAS, TX 75202-3797 | | | LEUNG, PHILIP H | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 3742 | |
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| | | | 12/05/2007 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/764,092

Applicant(s)

TOUR ET AL.

Examiner

Philip H. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4,9-11 and 39-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4,9-11 and 39-53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>7-16-2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4, 9-11 and 39-53 are rejected under 35 U.S.C. 103(a) as being obvious over Hjortstam et al (US 2002/0183207), in view of Sklyarevich et al (US 6,423,605) or Zhang et al (US 6,203,864) (all previously cited) and further in view of Kajiwara (US 6,833,086) (newly cited).

Hjortstam shows very feature as claimed except for the explicit showing that the carbon nanotubes are subjected to microwave radiation while in an inert gas chamber or a vacuum chamber. More particularly, Hjortstam shows exposing carbon nanotubes (paragraph [0037]) to microwave source the microwave radiation source as it states in paragraph [0031]:

By using electromagnetic radiation, such as microwaves or light to irradiate nanostructures, excited electrons are produced. The electrons in the valence band of semiconducting nanostructures absorb electromagnetic radiation and cross the bandgap to the conduction band, which leads to an enhanced conductivity. In semiconducting nanostructures absorption can only take place if the irradiating energy is greater than the bandgap energy.

The limitations “causing light emission” in claim 1, “causing mechanical motion” in claim 2,

“causing reconstruction” in claim 3 and “outgassing absorbed or adsorbed species” in claim 4 are inherent functions and results in Hjorstam as it shows exposing carbon nanotubes (paragraph [0037]) to the microwave radiation source. Therefore, Hjortstam shows very feature as claimed except for the explicit showing that the carbon nanotubes are subjected to microwave radiation while in an inert gas chamber or a vacuum chamber. However, Sklyarevich teaches cooling the processed material with a cooled gas that did not have any influence on the activation process to reduce diffusion (page 6, lines 63-67). As to wherein the carbon nanotubes are subjected to microwave radiation while in a vacuum chamber, Sklyarevich teaches a vacuum chamber 10 (col. 5, lines 45-49; and Fig. 2). Similarly Zhang shows irradiating carbon nanotubes with electromagnetic wave in a high vacuum chamber or in an argon or a nitrogen (inactive gas) atmosphere (see the abstract, col. 4, line 8 – col. 5, line 12). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Hjortstam with wherein the carbon nanotubes are subjected to microwave radiation while in a vacuum chamber or in an inert gas chamber because this would have cooled the processed material with a cooled gas that did not have any influence on the activation process to reduce diffusion, in view of the teaching of Sklyarevich or Zhang. In regard to the newly added limitation “causing one or more gases to be absorbed or adsorbed to the carbon nanotubes” is inherent in most carbon nanotubes before requiring purification or outgassing. Kajiwara shows that it is well known that carbon nanotubes are heated for releasing gas containing a substance that was adsorbed by the nanotubes (see col. 32, lines 46-53 as reproduced below:)

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Then, for releasing gas from the carbon nano-tubes 51, a heating treatment or various plasma treatments may be carried out. For allowing a substance to be adsorbed to the surfaces of the carbon nano-tubes 51, the carbon nano-tubes 51 may be exposed to a gas containing the substance whose adsorption is desirable. For purifying the carbon nano-tubes 51, an oxygen plasma treatment or a fluorine plasma treatment may be carried out.

It would have been further obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Hjortstam to use single-wall carbon nanotubes absorbed or adsorbed with a gas before the required heating and gas releasing to form highly purified carbon nanotubes, in view of the combined teaching of Sklyarevich or Zhang with Kajiwaru. The limitation "greater than 90% purity" would be a matter of engineering expediency once it is taught by Kajiwaru that carbon nanotubes can be purified. As to wherein the vacuum is between approximately 10^{-4} torr and 10^{-8} torr and the microwave frequency is between 0.1 GHz and 100 GHz as claimed in claims 9, 10 and 45-50, Sklyarevich also teaches that a person of ordinary skill in the art can easily modify the installation for manufacturing processes of various scales (col. 5, lines 65-67; and Fig. 2). Thus, the vacuum and microwave frequency are result effective variables which one of ordinary skill in the art can determine to carry out the desired reaction. Furthermore, the claimed microwave frequency range is the industrial standard and the vacuum degree is similarly shown in Zhang (see col. 4, lines 43-47). It is noted that Kajiwaru patent is the counter part of WO02/074879 published on 9-26-2002.

3. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

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4. Applicant's amendment necessitated the new ground(s) of rejection presented in this

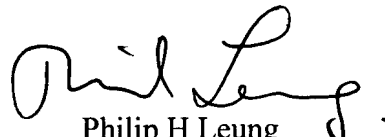
Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Philip H. Leung whose telephone number is (571) 272-4782. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tu Hoang can be reached on (571)-272-4780. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Philip H Leung
Primary Examiner
Art Unit 3742

P.Leung/pl
11-10-2007